

## Progress Report

## TRAFFIC SPEED REPORT NO. 65.

TO:

K. B. Woods, Director

Joint Highway Research Project

May 14, 1959

FROM:

H. L. Michael, Assistant Director

Joint Highway Research Project

File: 8-3-3 Project: 0-36-100

The attached Traffic Speed Report No. 66 has been prepared by Mr. Donald F. Petty, Research Assistant on our staff, under the direction of Prof. N. L. Nichael.

This report presents the analysis and data for the winter season of 1959. The Project has conducted similar studies at the same locations semi-annually for the past twenty years. Copies of this report will be distributed as usual to the Indiana State Police, the Indiana Office of Traffic Safety, and the Burssu of Public Roads. The report is submitted for the record.

Respectfully submitted,

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H. L. Michael, Secretary

HIM: ac

Attachment

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## TRAFFIC SPEED REPORT NO. 66

This report covers spot speed observations made from December, 1958, through March, 1959. The data were collected by the writer. All observations were made of free-moving vehicles on level tangent sections of rural highways. The locations of the observations were as follows:

- 1. U.S. 52 1.0 miles South of S. Jot. S.R. 28 (Dual Lanes)
- 2. U.S. 52 1.0 miles West of Klondike (Dual Lanes)
- 3. U.S. 52 2.2 miles Northwest of Templeton (2 Lane)
- 4. U.S. 31 7.2 miles North of Perrysburg (2 Lane)
- 5. S.R. 25 .7 miles South of Americus (2 Lane)
- 6. U.S. 41 1:0 miles North of Boswell (2 Lane)

The speed observations for this study were made with an Electro-Matic Radar Speed Meter. The meter was concealed as part of a rural mailbox which was placed approximately two feet from the edge of the pavement. It was directed along the highway at a small angle with respect to the direction of traffic so that it was not necessary to apply an angle correction to the readings.

Radar equipment will not operate properly if the operating voltage is more than 1/2 volt low or 1 volt high. The voltage, therefore, was checked periodically in the field with a voltmeter and maintained within the desired range. The radar equipment was also maintained in correct calibration by checking the registered speed with a 60 MPH tuning fork.

The observer concealed himself from the traffic as far from the highway as local conditions required. This was possible by using a 150 foot extension cable between the meter reading unit on which the



chat the speeds of the remicier dem- now infilm most by the equipment or the photograps.

Seven stables is given in Table 7. Indicate crate less limits the speed of passenger cars and under usighing less that 5,000 prunds to 65 miles per hours. During the period of these studies, the maximum speed high for tracks weighing more than 5,000 paneds was 45 miles per hour. The denoted Assembly of Instable, it work, changed this in their last session so that the maximum speed limit for tracks weighing more than 5,000 pounds is now 50 miles now home on all highways except that on four-lane highways which have a maximum strip at larest 20 feet wide the stable a speed limit is 55 MPH. They have of the speed limit signs on the highways have been changed as of few 1. 1959 to reflect this new regulation, however. This change in opening in the smaller than the analysis of these future studies.

Truck species are shown for three groups: light trucks, heavy trucks and all trucks; also, it is noted in each table whether the road is a two-lane or four-lane typ: (all b-lane bighways studied had a median greater than 20 feet of the). Shows it is improvibled to accurately estermine the exact weight of each truck, panel and single-wheel pickup wypes were classed as less than 7,000 points. All other types of trucks was elassed as weighting over f.000 points.

In order to acquire the proment and head provious observations at a given leastion, the results of cuch study are mabulated in Tables



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TABLE I
SUMMARY OF SPOT SPEED OBSERVATIONS
ON INDIANA HIGHWAYS

(Free-Moving Vehicles on Level, Tangent Sections)

			Passenge	er Cars	Trucks							
		Ind Mean	Non-Ind Mean	All Mean	All 85 per	Light Mean	Heavy Mean	All Mean				
Iwo-lane Highways J	July 955	53.8	55.7	54.5	64.8	46.2	45.5	45.5				
E	eb.º56	54.9	58.0	55.9	63.2	47.1	43.2	4404				
A	lug. 156	55.0	56.3	55.5	63.4	50.6	45.5	46.6				
14	lay 157	55.6	59.1	56.9	64.0	50.2	44.8	46.1				
A	lug.157	55.5	56.7	55.9	62.1	51.7	45.8	47.3				
A	lug. 158	54.3	56.3	55.0	61.7	53.0	46.3	47.8				
	ar. 159	55.5	57.7	56.1	61.9	50.4	45.4	46.3				
Four-lane Highways J	uly'55	54.5	56.6	55.2	63.7	47.5	43.9	44.8				
E	eb. 156	58.1	60.1	58.7	65.7	47.8	45.2	45.8				
A	lug. 156	57.4	58.8	58.2	66.8	49.6	46.0	47.4				
M	lay 157	59.9	63.6	61.0	69.0	52.2	46.0	47.9				
A	ug. 157	57.5	59.9	58.5	64.8	52.0	46.6	47.6				
A	ug. 158	58.0	59.6	58.7	65.0	54.3	49.0	50.0				
M	lar.159	58.2	61.7	59.0	64.09	53.6	47.0	48.4				
All Highways <u>J</u>	July 55	54.1	56.6	55.2	64.3	46.9	4467	45.2				
F	eb. 156	56.0	58.6	56.8	63.8	47.3	44,00	44.9				
A	lug. 156	55.7	57.3	56.4	64.5	50.2	45.6	46.9				
E	lay 157	57.2	60.3	58.3	66.0	50.9	45.2	46.6				
A	lug.157	56.2	58.3	56.9	63.2	51.8	46.1	47.4				
M.	lar. 159	56.6	59.0	57.2	63.1	51.5	45.9	47.0				



1.0 Mile South of South Jct. S. R. 28 on U. S. 52 Station #1 -

This Observation

This Observation

Date Feb. 25, 59, March 4, 59

Time 2:00 - 4:15 P.M. 2:00 - 3:45 P.M.

Weather Sunny & Clear Last Previous Observation (Speed Report No. Date July 25, 1958

Time 2:00 - 4:15 P.M. 2:00 - 3:45 P.M. Surface

Cloudy & Dry

SES	ALL	Present	e de la companya de l		1		1		1		1	1	•				1			1		1	
BUSSES	Ā	Last			-		1		1	-	-	ł			•	-	1	-		1	1	1	1
	5000 pounds	Present	135	47,3	68.9			2,2	0	0	0	89	50.1	62	l	32	1	67	44.5	54	4	30	1
	5000	Last		47.6	76.0	33,3	5,3	0.0	0.0	0.0	0.0	36	46.6	54	1	34	-	39	48.5	58	-	36	1
KS	than	Present	26	53.5	84.6	69.2	46.2	26.9	3.9	3.9	0	18	52,1	20	1	38	1	8	56.5	79	1	45	1
TRUCKS	Less than 5000 pounds	Last	12	50.8	75.0	66.7	33,3	25.0	0°0	0.0	0.0	3	39.7	52	1	27	1	6	54.4	63	1	4.3	1
	-	Present	191	48,3	77.06	43.5	18.0	6,2	.62	.62	0	86	50.5	70-		35		75	45.8	- <del>1</del> 9		45	
	LLA	Last	87	0°87	75.9	37.9	9.2	3.4	0.0	0.0	0.0	39	46.1					84	9.64				l
	diana	Present	81	60°7	98.86	55.1	87.7	64.2	23.5	8.6	2.5	36	62.7	7/4	-	50		45	58.9	75	1	38	1
	Non-Indiana	Last		59.8	980	95°6	80,3	12,2	17.7	4°9	2.0	106	59.5	92	1	43		65	60°2	90	1	1,2	
EER CARS	Indiana	Last Present	301	59°4	- <del>97</del> 0	91.7	80,1	54.8	20.9	9.3	2,33	109	59°7	86	Ì	38	1	192	59°3	75	-	35	
PASSENGER	Ind	$\overline{}$		58°7	9602	88.7	74.6	787	17.8	8,0		106	58.7	78	ŀ	17		107	58°7	76		35	İ
	1	Last Present	382	59°7	97°4	92.4	81.7	56.8	21.5	9.16	2,36	14.5	97.09	<del>- 98</del>	-	38		237	59.2	75	-	35	- Mon
	LTA	Last	917	59°3	97-1	92.1	77.4	50.2	17,8	7,2	1.9	212	59.1	3	-		-	204	39.4				
		OBSERVATION	No. of Vehicles Obs.		o w 45 m pobo	u y	m Tu	9:	oxi	₹ 70 m.p.h.	ъе 5 75 m.p.h.	No	S Ave Speed (mopohe)		State or Type	Min. Speed (mon.h.)	State or Type	No. o	Sheed (man, b)		State or Type	Min. Speed (m.p.h.)	



H TABLE

1 Mile West of Klondike on U. S. 52 Station #2 -

24' Portland Cement Concrete 4 Lane Divided. This Observation Surface

Weather Cloudy & Dry Last Previous Observation (Speed Report No.

Date December 30, 1958
Time 1:30 P.M. - 4:05 P.M.

Date August 12, 1958
Time 2:40 P.M. - 5:51 P.M.

ES	5	Present	1					-	1		- General	1					-	1	•				
BUSSES	A	Tagt.	-	1	-				1								1	1			1	1	
	5000 pounds or more	Present	78	9.94	70°5	24.4	0.6	1,3	1,3	1	-	28	0.84	56		17	1	50	45.8	57	•	29	1
	5000 J	Last		50.1	80.0	62.0	25.0	0.9	0	0	0	43	47.6	09		29	1	57	52.0	63	1	36	1
KS	than	Present	31	53.7	90.08	77.0	41.9	32,2	12.9	3,2	-	18	53.2	77	•	34		13	54.5	89	-	37	1
TRUCKS	Less than 5000 pounds	Last	26	55.9	100.0	73,1	46.2	30°8	19,2	3.8	3.8	6	52.4	779	1	45	1	17	57.7	77	1	45	-
	1	Present	109	78.6	73.4	37.6	18,3	10,1	9.4	6.	1	94	50.0	77	5000=	34-	5000-	63	47.6	89	5000	29—	70005
	LTA	Last		51.3	84.3	6403	29.4	1.1	4.0	0.8	0.8	52	48.4			•	ļ	7/4	53.3			•	1
	diana	Present	120	61.8	98.3	97.4	82.5	52.5	20,8	9.2	2,5	45	61.6	80	1	777	1	75	62.1	79		39	1
	Non-Indiana	Last		59.5	98.2	94.1	78.5	9°64	17.0	8,2	1.5	78	59.0	78		77	1	57	59.5	74	1	1,2	1
EER CARS	Indiana	Present	320	57.1	95.3	87.0	67.8	35,3	12,8	1.9	9°	158	58,3	77		36	•	162	56.0	78	1	38	
PASSENGER	Ind	Last		57.4	97.1	86.7	69,3	41.9	11.6	1,7	004	121	57.1	76		36	1	120	57.7	73		37	
	A11	Present	077	58°4	0°96	0°06	71.8	0.04	15.0	3.9	7	203	59.0	8	0.5	36	Ind	237	58.0	26	0.5	38	Ind
	A	Last	376	58.0	94.6	4°68	72.6	14.7	13.6	0°7	0	199	57.8				1	190	58.3	1			
		OBSERVATION	No. of Vehicles Obs.	Ave Speed (m.p.h.)	o 45 m. poho	50 m 2 h		9:	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	A 20 m.p.h.	38 0 75 noph.	No	Ave. Speed (mopoho)		State or Type	Min. Speed (m.p.h.)		No	Ave. Speed (m.p.h.)	Ī I	State or Type	Min. Speed (m.p.h.)	State or Type



52

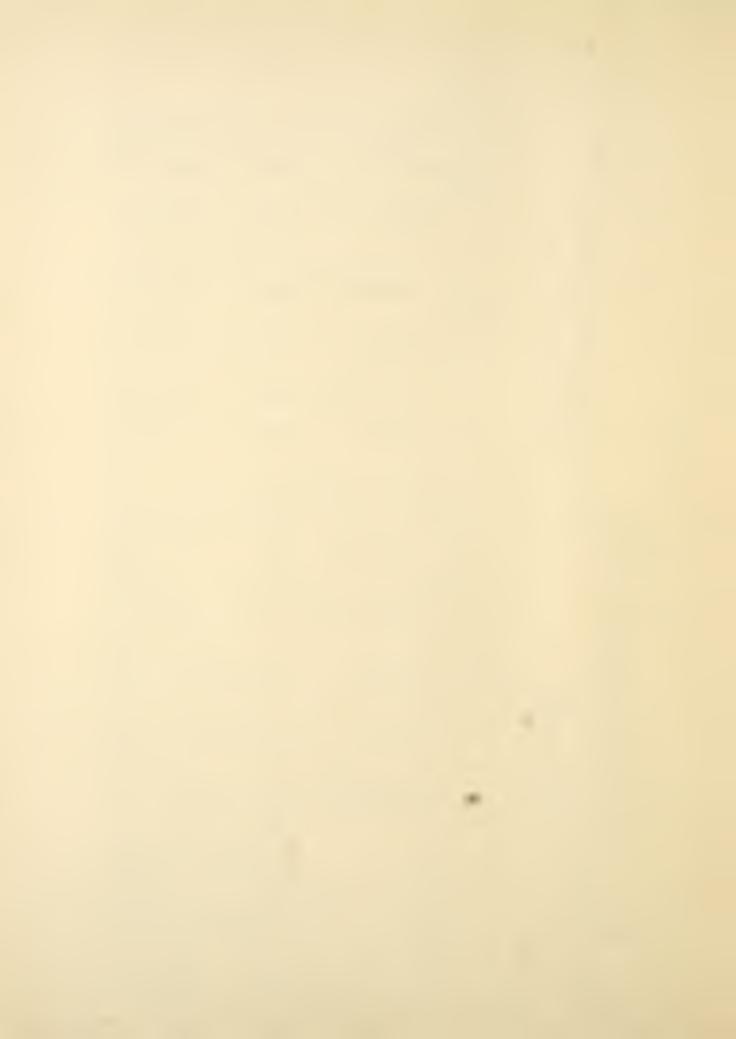
SPEED DATA

2.0 Miles North of Templeton on U. S. itation

Clear, Sunny, Good Last Previous Observation (Speed Report No. 11:04 A.M. - 1:13 P.M. 1958 Weather August 6, Date Date January 8, 1959 Time 2:45 - 4:30 P.M. 22' Bituminous This Observation 2 Lane Surface

Time

Presen 0 1 BUSSES All 1881 1 1 1 46.8 57 45.2 Presen 5000 pounds 0 0 82 38 0 33 181 0 22 66 EO L 2,3 44.0 10 Last 38 47.1 i Ц 0 3 28 88 38 Present 26 51.6 76.8 442.3 30.7 119.2 0 0 46.6 54.2 68 5000 pounds 39 8 79 17 Less than TRUCKS 75.0 75.0 48.5 56.5 Last i I 26 00 0 2 62 2 7 S Present 4.8 20.3 2.4 59.7 43.5 8 # 16 \$ 116 45 A 54.4 45.6 3.9 44.4 07 00 0 22 ast 92 149 4.7 54.8 72 87.2 38.9 52 62.8 Present 9503 14,1 Non-Indiana 1 1 75 8 2 0.0 Last 56.4 86.9 65.3 55.8 98 82 57,2 -1 2 18 7% 38 199 PASSENGER CARS Last Present 7.0 84.6 26,2 56,1 196-1 77 54.1 39 122 229 63 107 39 Indiana 84.4 13.5 56.4 58°5 56.5 56.3 78 39 63 141 7 Present 56°7 10°1 2°4 0°3 85.6 59.8 77 63.4 31.2 5404 72 219 39 159 38 ALL 56°4 33.2 10.9 1,5 85.9 62.4 26.0 56.8 Last -340 195 of Vehicles Obs No. of Vehicles Obs of Vehicles Obs Speed (m.p.h. State or Type Speed (m.p.h. Ave. Speed (m.p.h. State or Type Speed (m.poh. State or Type State or Type Speed (m.p.h. Speed (m.p.h. 75 H.D.D.D. 70 ш.р. р. 45 moneh 50 m.p.h. deg-m. 4° d = 09 4°d-m 59 OBSLRVATION Speed Min. Ave Non MEn. AVO No Veh cles ROOMD BOUND



8.0 Miles North of Perryburg on U. S. 31

Station #

Last Previous Observation (Speed Report No. Weather Cloudy & Dry August 5, 1958 Date Date March 30, 1959 Time 12:35 P.M. - 3:00 P.M. 22' Bituminous This Observation 2 Lane Surface

12:10 P.M. - 3:04 P.M.

Presen BUSSES ALL Last ł Present 9.94 36.8 7.0 32 48.2 63 5000 pounds 44.7 59 0 39 36 0 0 25 or more 1,2 9.97 2.4 46.9 34 0 87 R 27 resent 50.6 80.8 26.9 65.4 50.5 5000 pounds 183 Less than 38 5 0 0 0 TRUCKS 37 52.5 83.8 67.6 18,9 35.1 51.1 33 20 0 0 0 49 Present 6.97 83 45.8 0.9 66,3 13,3 3 0 0 F 9.87 70.6 20.2 7.6 0.8 0 68 47.9 42.9 51 49.5 ASt 0 68 58.4 98.5 92.7 69.1 14.7 5.9 2.9 2.9 2.9 2.9 Last Present 29 57.7 77 Non-Indiana 87 9 6403 56.3 94.0 1.2.0 48 36.9 89 38 7 PASSENGER CARS Last Present 110 3.8 79.4 57.6 55.3 128 -9 65 92 3 Indiana 22.6 8.1 88.9 45.3 32 33 135 8 19 ast Present 56.0 9308 4.3 3207 60.1 Inde Inde 167 All 49.5 2404 96.0 25.8 7.9 2.4 53.9 1 -380 197 183 No of Vehicles Obs No. of Vehicles Ubs of Vehicles Obs Speed (m.p.h. Speed (m.p.h. Speed (m.D.h. Speed (mop.h. Speed (mopoho State or Type State or Type State or Type State or Type Speed (m.p.h. Speed (m.p.h. 75 H.D.h. 45 Hepon. 50 m p.h. m.p.h. 4° d = 09 4. q. m 69 70 m p.h OBSERVATION gxceeggug AVE AVe. Min. AVE Min. Equaling 9 BOUND BOUND



TABLE

1 Mile South of Americus on S. R. 25 Station #5-

22' Bituminous 2 Lane Surface

This Observation
Date March 18, 1959
Time 2:00 - 4:15 P.M.

Last Previous Observation (Speed Report No. Date August 12, 1958
Time 10:50 A.M. - 1:34 P.M.

Weather Sunny, Clear, & Dry

	11	Present	1		1	1		1	1	-	1	1				1	1		1	1	1	1	
	A	Last	1	-	-		-		1	-	1	1	-	1	1	•		•	1	1	1	1	
spunoc	pore	Present	116	45.8	57.8	25.9	2.6	0.9	-		-	53	44.7	58	1	36	-	63	46.7	79	1	35	1
5000	or	Last	69	6.94	77.0	37.7	5.8	0	0	0	0	31	46.3	58	1	35	1	38	47.4	57	1	33	1
than	spuno	Present	34	50.8	79.4	50.0	29.4	17.7	1	-	•	19	48.3	63		39	1	15	53.9	63	1	1,2	1
Less	5000 p	Last	26	53.8	88.5	69.2	50.0	30.8	11.5	3.8	0	य	57.5	20	1	4.5	1	77	50.6	63		30	1
	1	Present	150	6.94	62.7	31,3	8.7	4.7	-	1	1	72	45.7	63		36	10	78	48.1	10	4	35	
	TA.	Last	95	48.8	75.8	46.3	17.9	8.4	3.2	1.1	0	43	7.67				-	52	48,3			-	1
	diana	Present	14	55.9	92.9	85.7	50,0	35.7	14.3	14,3	7.1	7	9.09	92	-	50	1	7	51.1	9	-	11/1	1
	Non-Ir	Last	98	56.2	93.0	75.6	60°5	41.9	11.6	5,8	2,3	39	56°5	23	ł	07	1	27	56.1	76	1	34	1
	lana	Present	337	55.0	6 <del>8</del> 68	76.0	48.4	29.4	11.6	4.2	1,5	747	55.4	82		37		190	54.7	96		33	1
	Indi	Last	318	53.9	88.1	72,3	47.5	24.8	9.9	1.6	0,3	176	53.1	70	9	37		142	55.0	77		38	
	11	Present	351	55.1	0.06	76°4	4804	29.6	11.7	4.3	1.7	154	55.6	82		34		197	54.0	96	1	33	
	A	Last	707	5404	89-1	73.0	50°2	28.5	7.7	2.5	0.7	215	53.7		0		1	189	55.2		1		1
		OBSERVATION	No. of Vehicles Obs.	Ave Speed	C.E. 54 P.	יטי	To C	111	ox; en!	ਜ . • ਜ	ł.	1	! .	Max	State or Type						State or Tvo	Min. Speed (m.p.h.)	State or Type
	Less than	9   50	All Indiana Non-Indiana All 5000 pounds or more Al Last Present Last P	All Indiana Non-Indiana All 5000 pounds or more All Less than 5000 pounds or more Al Al 5000 pounds or more Al 50	All   Indiana   Non-Indiana   All   5000 pounds   All   5000 pounds   All   Sounds   All   Sounds   All   Sounds   All   All   Sounds   All   All	All   Indiana   Non-Indiana   All   SOUO pounds   SOUO pounds   All   All   SOUO pounds   All   All   All   SOUO pounds   All   All	All   Indiana   Non-Indiana   All   SOOO pounds   SOOO pounds   All   All   SOOO pounds   All   All	All   Indiana   Non-Indiana   All   5000 pounds   Or more   All   5000 pounds   Or more   All   5000 pounds   Or more   All   Sounds   Or more   All   Or more   Or more   All   Or more   All   Or more   All   Or more   Or more   All   Or more   Or more   All   Or more   Or more	All Indiana Non-Indiana All 5000 pounds or more All Substitutes that Present Last P	All Indiana Non-Indiana All Less than 5000 pounds or more All 5000 pounds or more All Last Present Last Prese	All   Indiana   Non-Indiana   All   Less than   5000 pounds   All   COND pounds   All   All   COND pounds   All   All   COND pounds   All   All   COND pounds   All   All	All Indiana Non-Indiana All 5000 pounds or more Ave Speed (m.p.h.) 54.4 55.1 52.9 55.0 56.2 55.9 48.8 46.9 53.8 50.8 46.9 45.8 Ave Speed (m.p.h.) 54.4 55.1 52.9 55.0 56.2 55.9 48.8 62.7 88.5 79.4 71.0 57.8 Ave Speed (m.p.h.) 500.2 48.4 47.5 48.4 60.5 50.0 17.9 8.7 50.0 29.4 5.8 2.6 Ave Speed (m.p.h.) 500.2 48.4 47.5 48.4 60.5 50.0 17.9 8.7 50.0 29.4 5.8 2.6 Ave Speed (m.p.h.) 500.2 48.4 47.5 48.4 60.5 50.0 17.9 8.7 50.0 29.4 5.8 2.6 Ave Speed (m.p.h.) 500.2 48.4 47.5 48.4 60.5 50.0 17.9 8.7 50.0 29.4 5.8 2.6 Ave Speed (m.p.h.) 7.7 11.7 6.6 11.6 11.6 14.3 3.2 11.5 0 Ave Speed (m.p.h.) 5.0 5.5 4.3 1.0 5 2.3 7.1 0 0 Ave Speed (m.p.h.) 5.0 50.0 1.0 5	CBSERVATION   Last Present Last Last Last Last Last Last Last Las	CES_RFV_A[I]   Lost   Present Last   Present   Last   Last	All   Indiana   Indiana   Non-Indiana   All	All   Indiana   Non-Indiana   All   Last Present Last P	All   Indiana   All   Indiana   Non-Indiana   All   5000 pounds   Or more   All   511	CBSJRVAFION   Liest Present Last Present L	CBSLRWALTON	CBS-RW.fillN	CESSENATION   Last Present Last Last Last Last Last Last Last Las	CESHWALTON   Last Present Las	All   Indiana   Non-Indiana   Non-Indiana   All   Less than   5000 pounds   All   Less than   5000 pounds   All   Less than   CED-NVA (ION   Least Present Last



VII TABLE

1.0 Mile North of Boswell on U. S. 41 Station #6-

Weather Cloudy & Dry Last Previous Observation (Speed Report No. 1 Date Date March 31, 1959
Time 9:30 A.M. - 12:30 P.M. 22' Bituminous 2 Lane 22' Bit This Observation Surface

SES	=	Present	1	ı		1			1	1	1	1	1	1					-			-		
BUSSES	£.	Last.	1	1					1	1	1	1	1	1			ŀ	1					Ì	
	5000 pounds or more	Present	1 9/2	44.2	4.74	23,1	0°7	0	0	0	0	43	44.1	55	-	36	1	33	44.3	58	1	30	1	
	5000 or	Last	1	ı	1	١		-	1	1		1	1	1	-	1	1	1	ļ	-	ŀ		ł	
KS	than	Present	23	0.84	9.69	47.8	21.7	4.4	0	0	0	6	45.7	51	-	36		14	9°67	79	1	32	1	
TRUCKS	Less than 5000 pounds	Last	1	ļ	ł	ı		-	i	1	1	1	1		}	ļ	1		1	I	1	ı	1	
	7	Present	66	45.1	52.5	27.3	8,1	1,0	0	0	0	25	0°77	-55-	Coop 7	1380	1683 &	47	45.9	150	1988 V		Over.	Jonn's
	LTA	Last	1	•	1	•		1	}	I	1	1	1						1		1	I		
	Non-Indiana	Present	183	9,95	96.17	91.3	68,3	32.8	9.8	1.1	0	76	57.0	70	1	1,2	-	89	56.1	Z Z	1	38	1	
	Non-In	Last	1	-		1	at command	-	ı	1	1	-	-		1	-		1	1	1	1			
1	CARS	Present	128	56.2	96.1	79.7	63.3	34.4	11.7	5.5	1,6	79	57.5	78		42		79	55.0	7/4	1	34	1	
PASSENGER	Ind	Last	1	1	-	1	1	ı	I	1	1	1	1	ł	ł	I		1	1	1	t	1	ł	
	All	Present	311	56.5	96.0	86.5	66,2	33.4	10.6	2.9	9.0	158	57.1	78	End.	1.2	Ind. &	153	55.6	地	Ind.	34	Inde	
	A	Last				1	1		1		ł	}	1	1			-	-	1	1	-		L SEE	
		OBSERVATION	No. of Vehicles Obs.		0 50 45 m. 20ho	ับร	p u	93	Six	ਜ਼ - >ਸ਼	№ 0 75 nopho	No	S Ave Speed (monoho)		- 14	Min. Speed (m.p.h.)		No o	S Ave. Speed (m.p.h.)	1		Mfn. Speed (m.p.h.)		



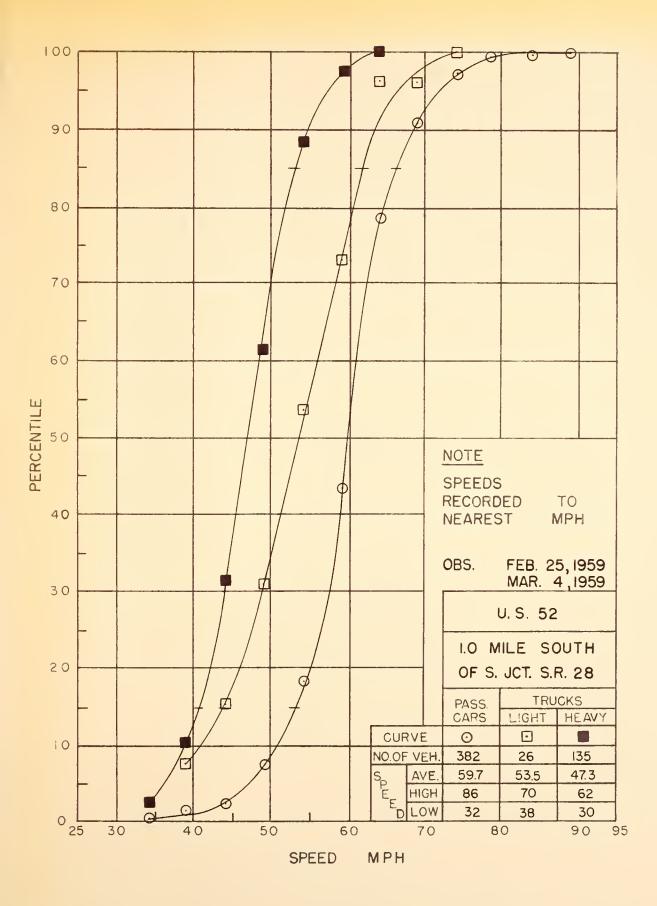


FIGURE 1



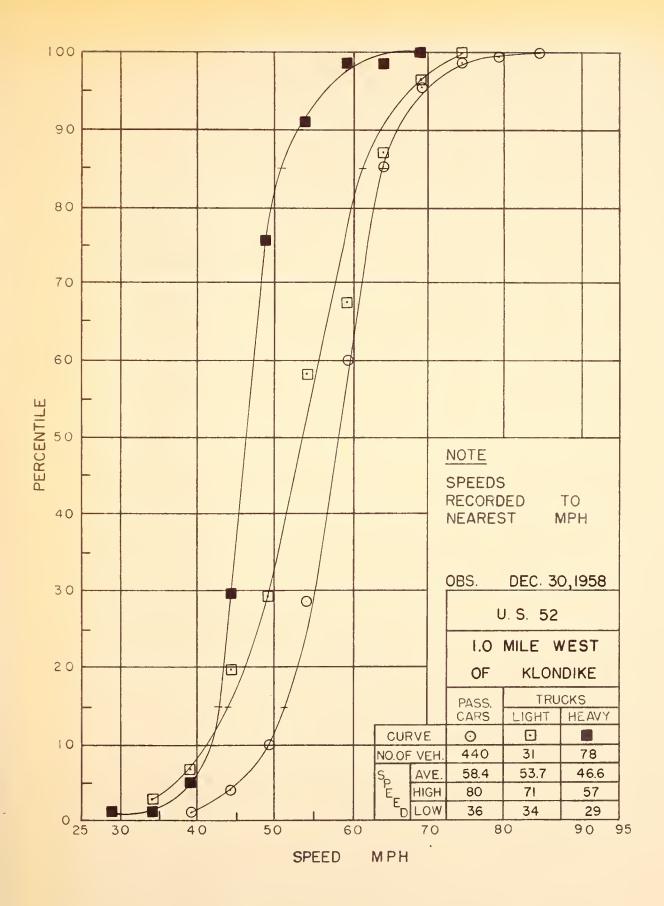


FIGURE 2



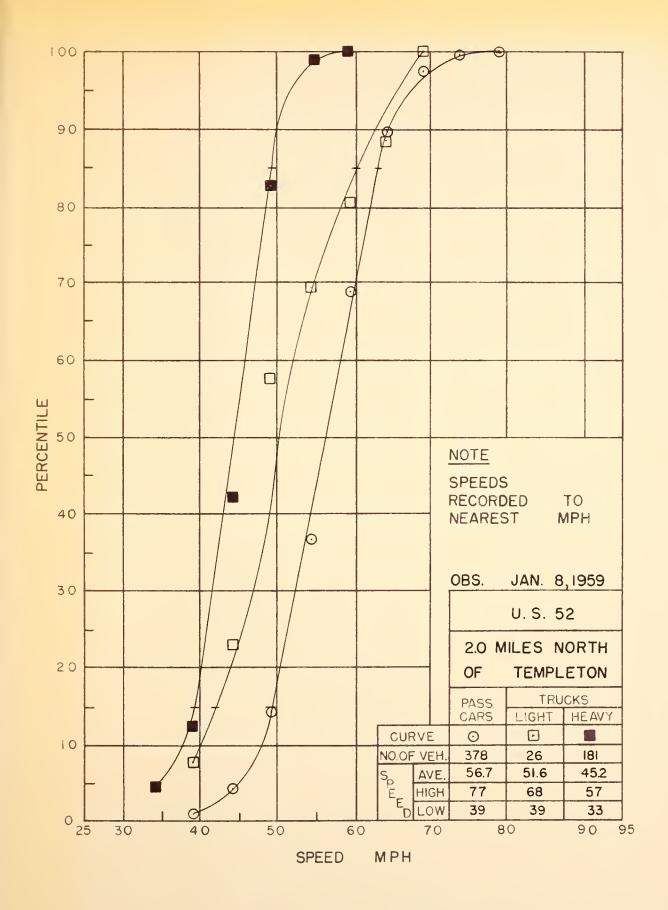


FIGURE 3



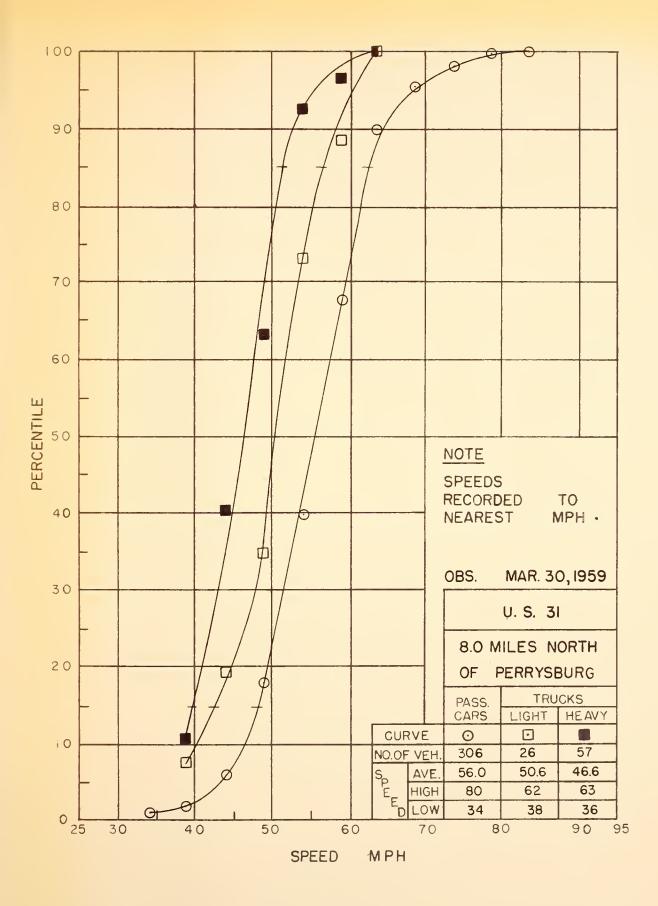


FIGURE 4



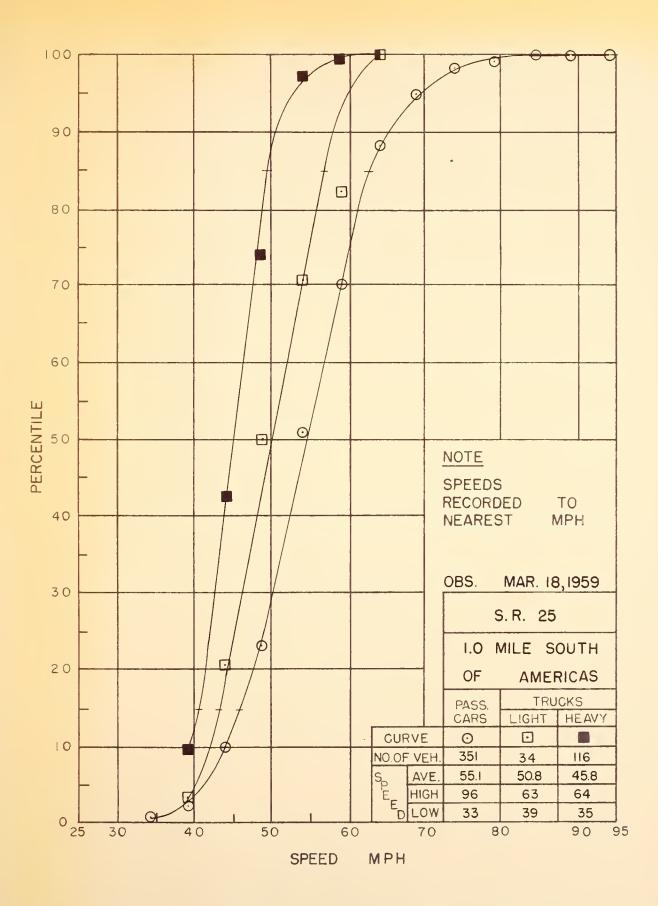


FIGURE 5



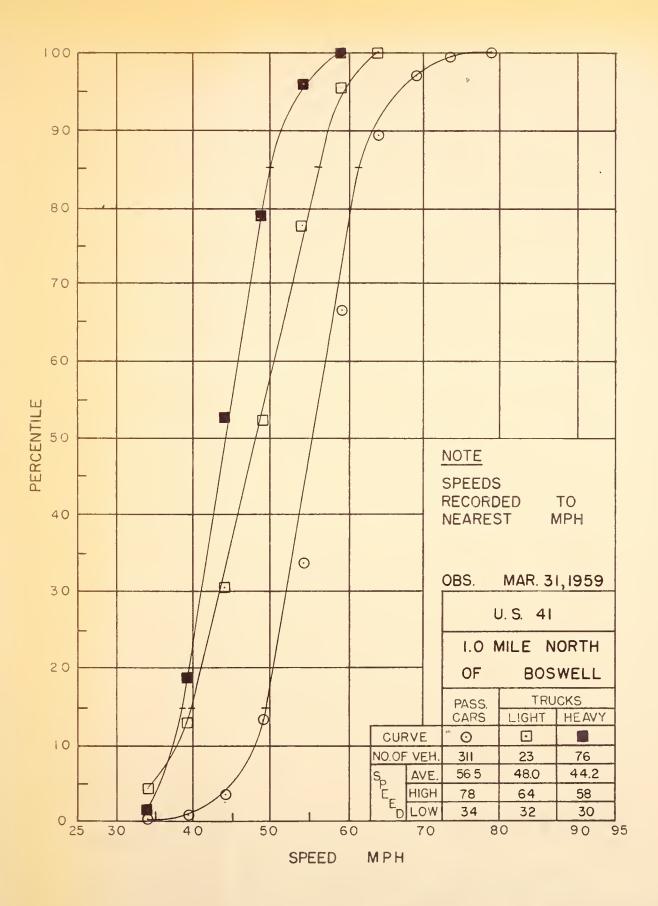


FIGURE 6



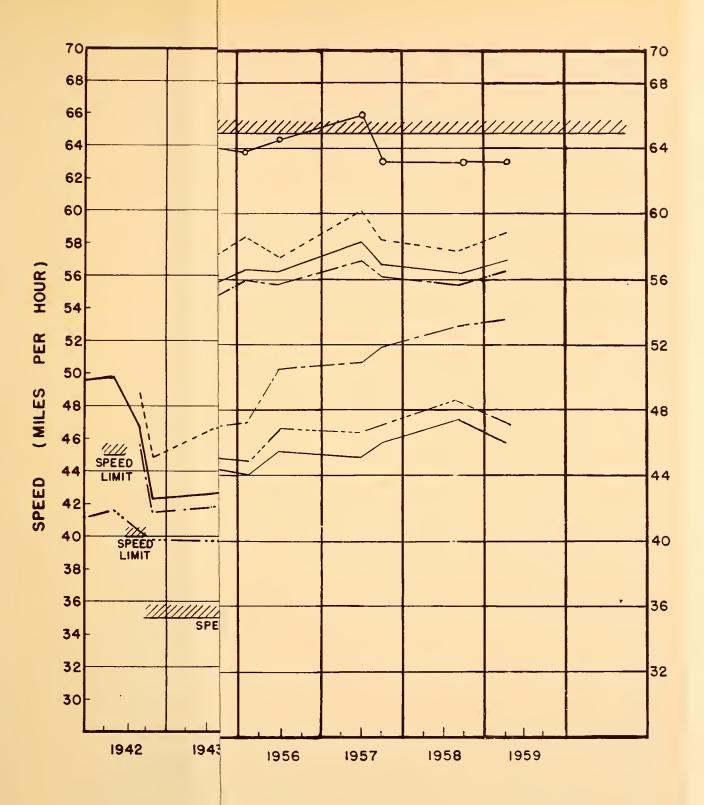


FIG. 7



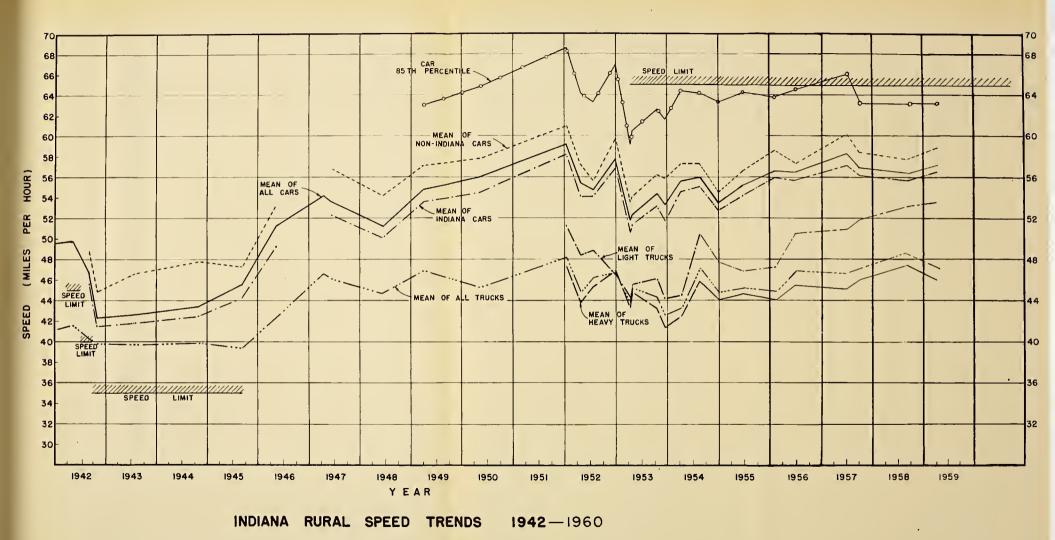
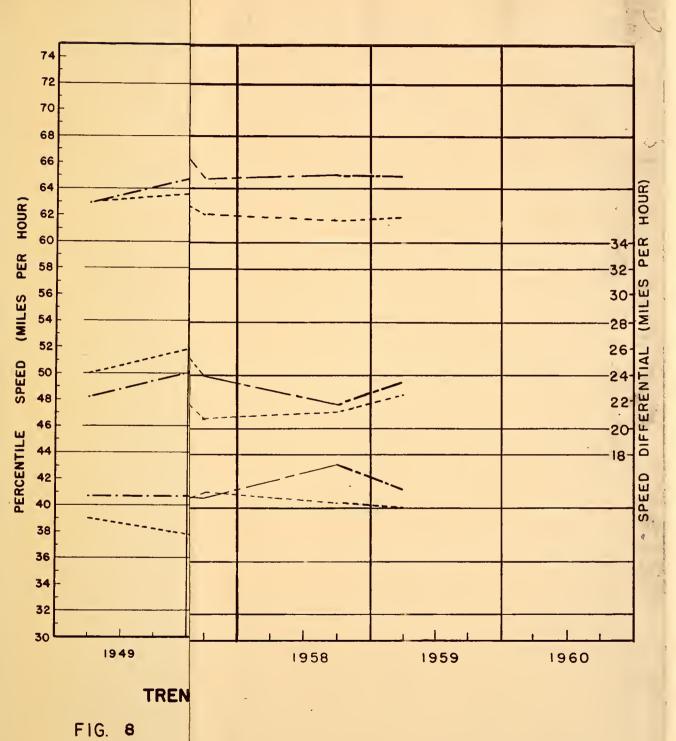


FIG. 7







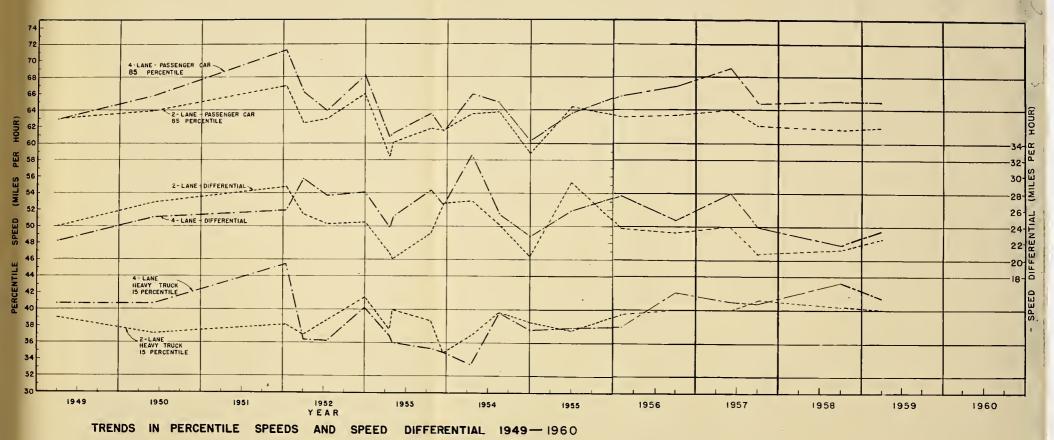


FIG. 8





